Example #7: Designing a Sag Vertical Curve

Design a length of vertical curve for a sag curve based on

1. Comfort Ride
2. Headlight Sight Distance

Design Speed = 40 mph SSD = 305 g1 = -3.2% g2 = +2.4%

Solution:

Determine the change in grade elevation A = |g2-g1| = |2.40-(-3.2)|

A = 5.6 %

Comfort Ride Equation

$L=AV^2/46.5$

$L = 5.6*40^2/46.5$

L = 192.69 ft

Remember, MoDOT rounds length of vertical curve to the nearest 10 ft

Headlight SD:

Assume S > L:

L = 2S – [(400 + 3.5S)/A]

L = 2*305-[(400+3.5*305)/5.6]

L = 610 – 262.05

L = 347.95 ft S ~~>~~ L

Assumption is wrong, let's try again

Headlight SD:

Assume S < L:

$L=AS^2/(400 +3.5S)$

$L = 5.6*305^2/(400+3.5*305)$

L = 520940/1467.5

L = 354.98 ft S < L

Assumption is correct